NARRATIVE

NEW UNION

The new K-5 elementary school in Gallatin, Tennessee is approximately 91,000 square feet in area, including all alternates to the project. Ventilation requirements of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) were utilized in this study.

The base case concept for the heating, ventilating, and air conditioning (HVAC) system was the standard water source heat pump system with a circulating water loop for the condenser coils and a natural gas-fired boiler and closed-circuit cooler for heat addition and rejection. Zones within the building are served by self-contained heat pump units, which supply conditioned air through ducts and diffusers in the spaces. Each zone is controlled by its respective thermostat.

The geothermal system utilizes very similar heat pump equipment except heat is rejected and added via heat exchangers configured vertically in the ground. Each heat exchanger is located in a vertical bore about 300 feet deep. The building interior water loop is circulated via pumps to the "borefield" located outside, underground. Each bore contains a 1-inch supply and return pipe. The extent or number of bores determines the overall capability to reject heat or absorb heat from the constant temperature ground soil. Thus, no boiler or cooler is needed for the water loop. All heat exchange is confined to the borefield.

The geothermal units are capable of handling water loop temperature ranges lower than the usual water source heat pumps. This feature usually allows the heat pumps to operate at cooler refrigerant temperatures which allow greater mechanical efficiencies and extended equipment life. Therefore, energy and maintenance costs are significantly less than other concepts. Also, the statistical service life of this equipment is twenty years.

A test bore was prepared and tested at the Gallatin project site to determine the actual ground temperature and thermal conductivity. The following results were found:

Thermal Conductivity	1.65 * btu/hr-ft-f
Ground Temperature	58.2 , Degrees F

The above values are favorable. The computed length of bores is about 47,000 feet, requiring about 160 bores, three hundred feet deep and 16 feet on centers.